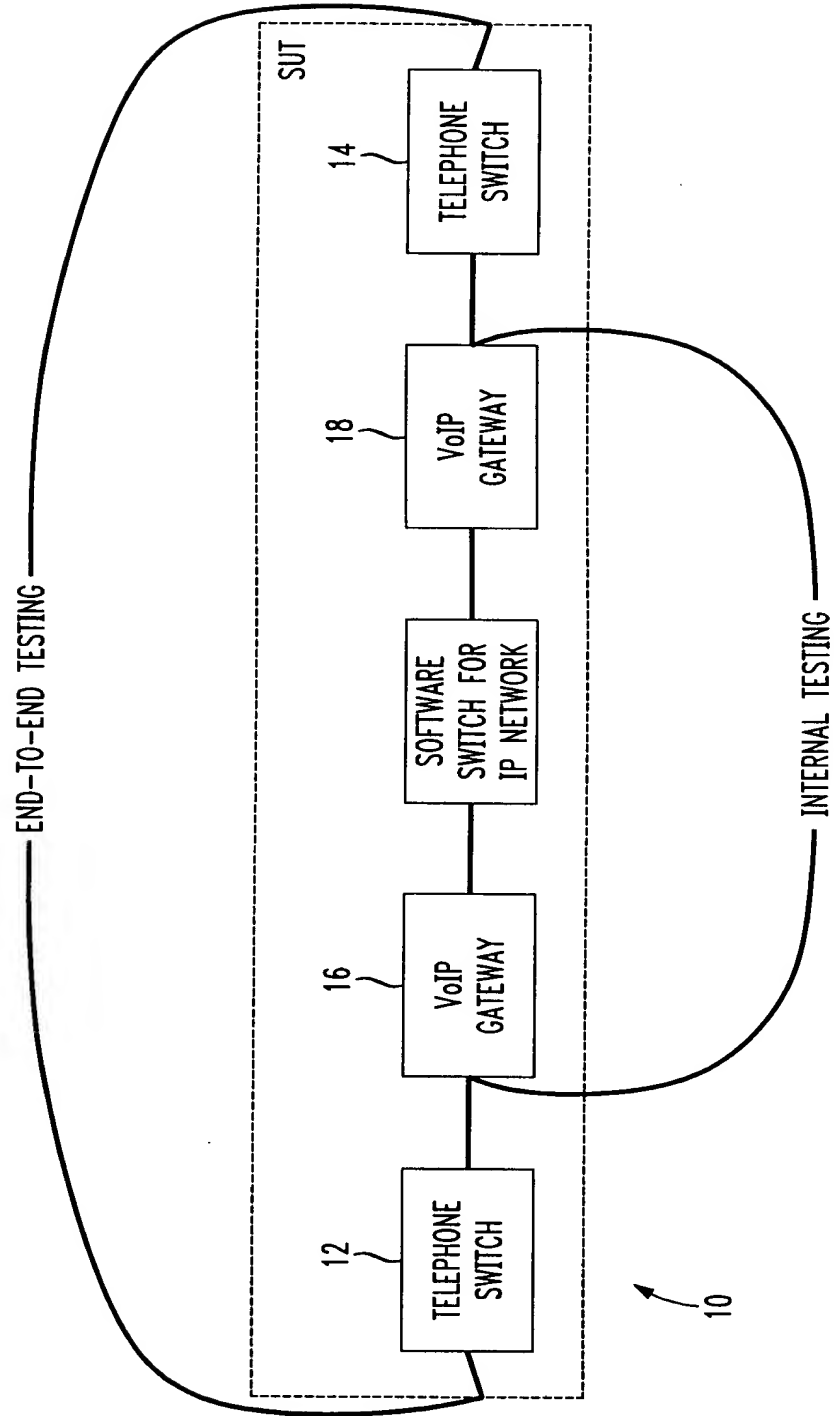


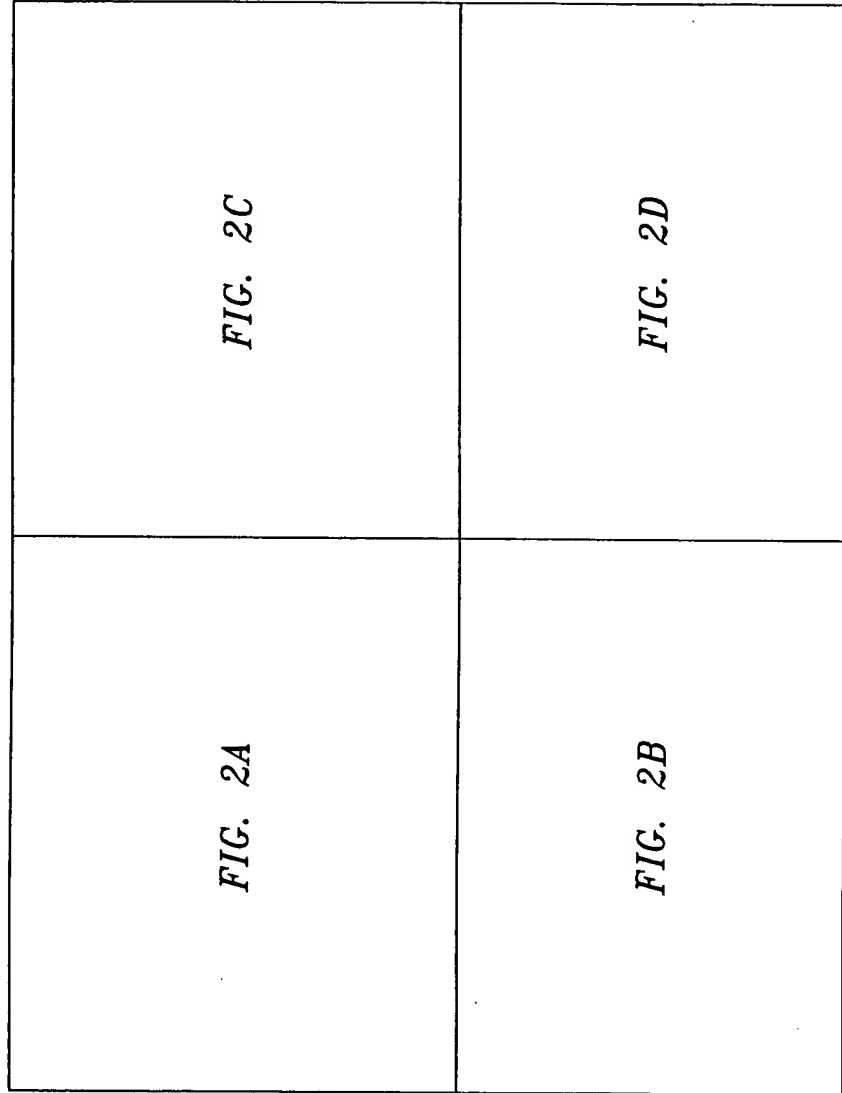
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FIG. 1

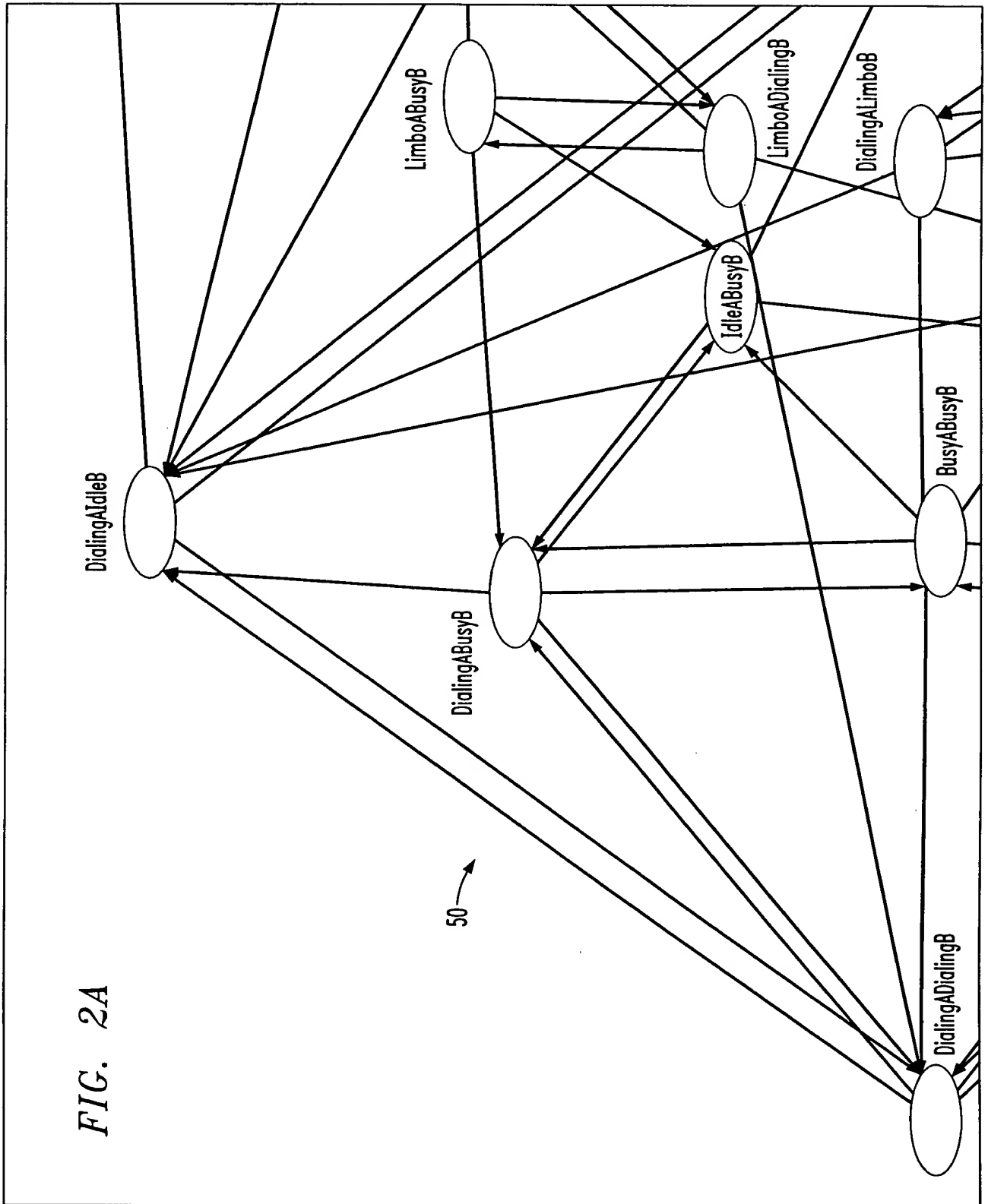


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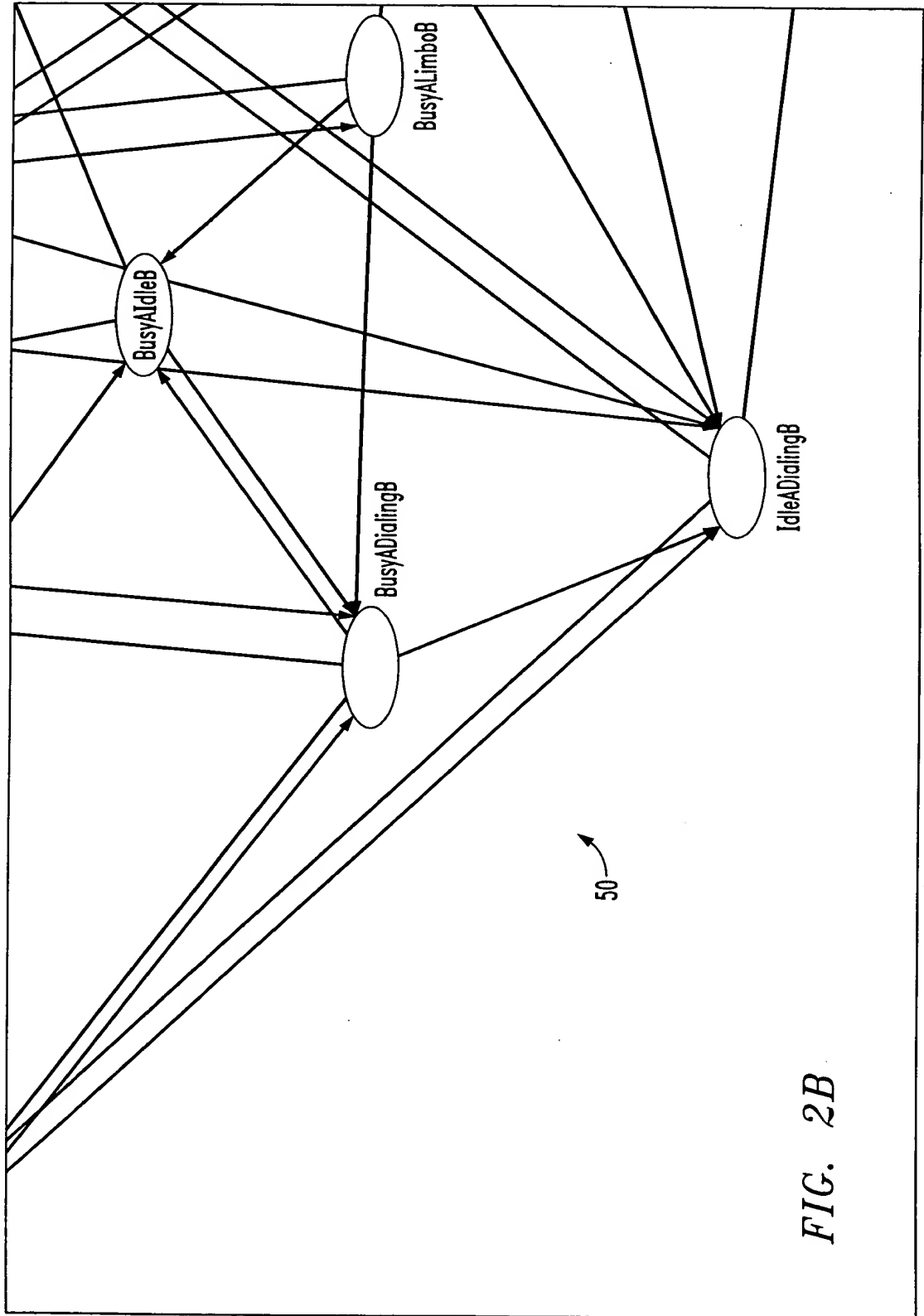
FIG. 2



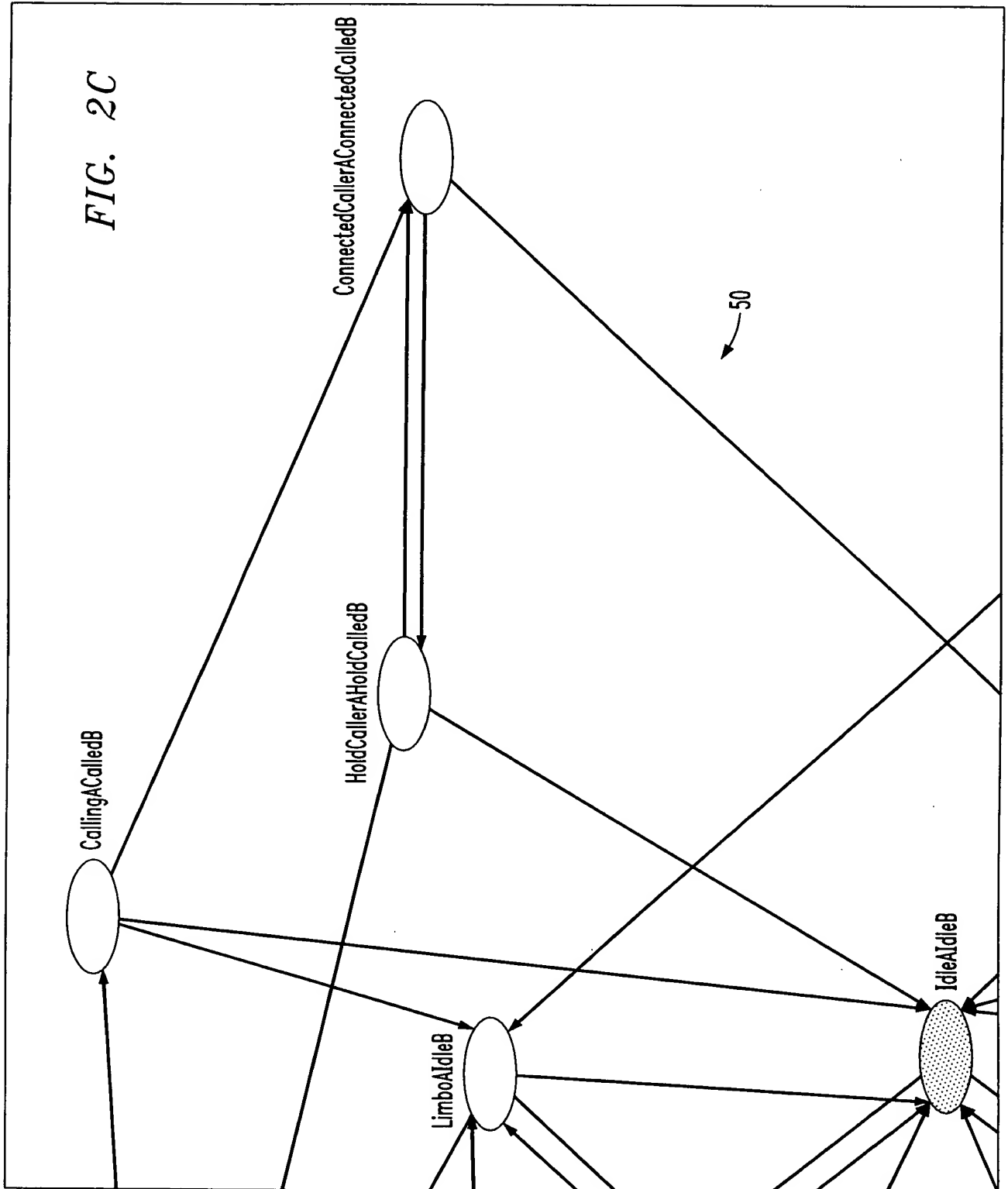
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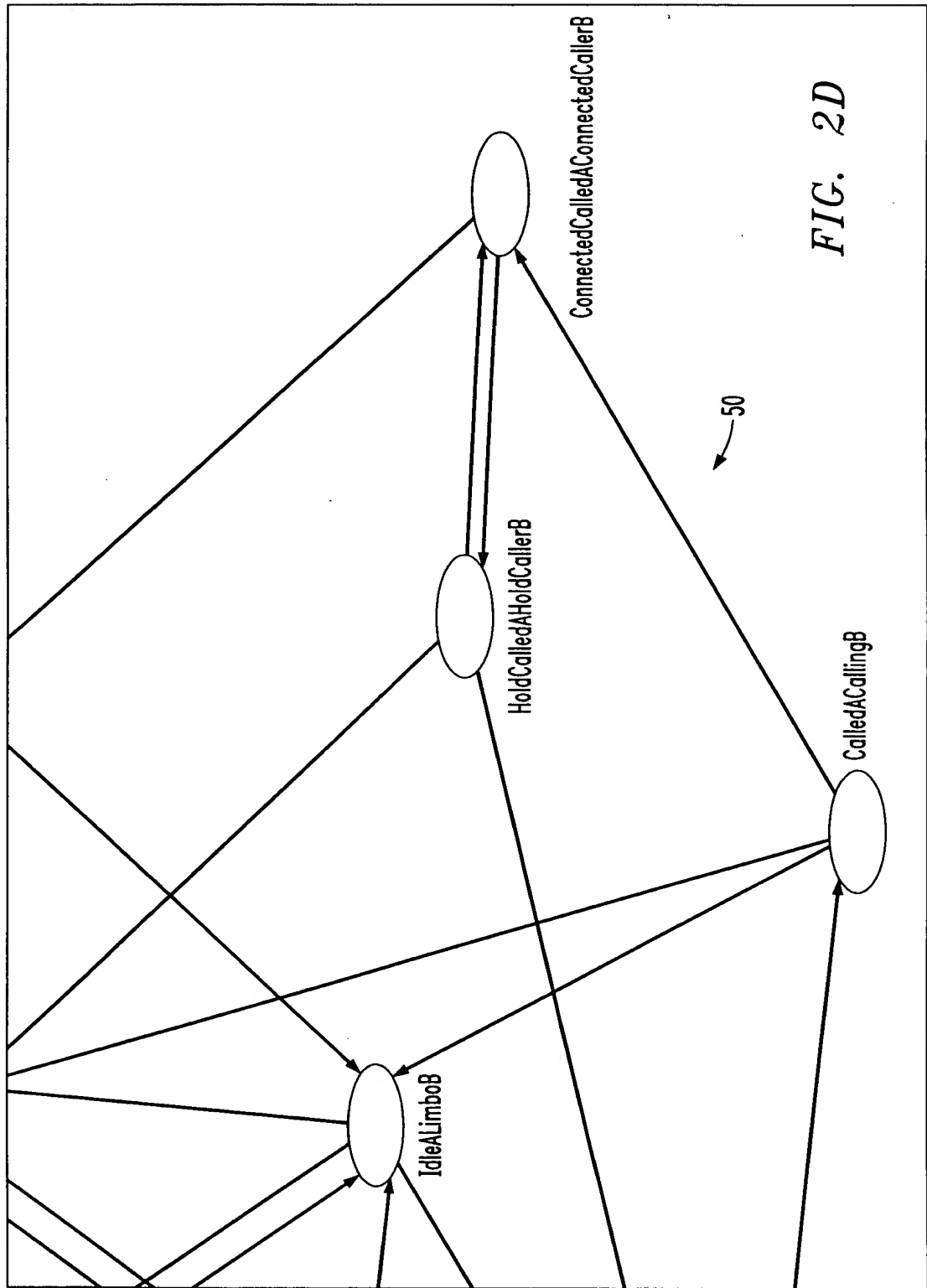
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FIG. 3

```

gui efsm
states { 21
1. CallingACalledB
2. DialingADialingB
3. IdleABusyB
4. CalledACallingB
5. BusyABusyB
6. DialingALimboB
7. BusyADialingB
8. BusyAIdleB
9. BusyALimboB
10. LimboADialingB
11. ConnectedCalledAConnectedCallerB
12. LimboABusyB
13. IdleADialingB
14. LimboAIdleB
15. DialingABusyB
16. HoldCalledAHoldCallerB
17. HoldCallerAHoldCalledB
18. DialingAIdleB
19. IdleALimboB
20. ConnectedCallerAConnectedCalledB
21. IdleAIdleB
}

```

i = input
o = output
p = predicate
a = action

```

start {
IdleAIdleB

boolean term=false;
boolean IdleA=true;
boolean IdleB=true;
boolean DialingA=false;
boolean DialingB=false;

}

transitions { 68
1. BusyADialingB BusyAIdleB {
i { {On-hook B} }
o { {} }
p { true }
a { { DialingB=false; IdleB=true } }
}
2. IdleADialingB DialingADialingB {
i { {Off-hook A} }
o { {DialTone A} }
p { true }
a { {IdleA=false; DialingA=true} }
}
3. BusyADialingB IdleADialingB {
i { {On-hook A} }
o { {} }
p { true }
a { { IdleA=true } }
}
4. IdleABusyB IdleAIdleB {
i { {On-hook B} }
o { {} }
p { true }
a { {term=true;IdleB=true} }
}

```

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FIG. 4

<p>5. HoldCallerAHoldCalledB IdleAIdleB { i { {On-hook A} } o { } } p { true } a { {term=true;IdleA=true;IdleB=true} } }</p>	<p>11. BusyABusyB BusyAIdleB { i { {On-hook B} } o { } } p { true } a { { IdleB=true } } }</p>
<p>6. IdleALimboB IdleADialingB { i { {Timeout B} } o { {DialTone B} } p { true } a { { DialingB=true } } }</p>	<p>12. DialingADialingB BusyADialingB { i { {Dial A B} } o { {LineBusyTone A} } p { true } a { DialingA=false } }</p>
<p>7. BusyADialingB BusyABusyB { i { {Dial B A} } o { {LineBusyTone B} } p { true } a { { DialingB=false } } }</p>	<p>13. IdleAIdleB IdleADialingB { i { {Off-hook B} } o { {DialTone B} } p { !term } a { {IdleB=false; DialingB=true} } }</p>
<p>8. HoldCalledAHoldCallerB IdleAIdleB { i { {On-hook B} } o { } } p { true } a { {term=true;IdleB=true;IdleA=true} } }</p>	<p>14. HoldCalledAHoldCallerB IdleADialingB { i { {Timeout AB} } o { {DialToneB} } p { true } a { { IdleA=true; DialingB=true } } }</p>
<p>9. DialingAIdleB DialingADialingB { i { {Off-hook B} } o { {DialTone B} } p { true } a { { IdleB=false; DialingB=true } } }</p>	<p>15. IdleABusyB DialingABusyB { i { {Off-hook A} } o { {DialTone A} } p { true } a { { IdleA=false; DialingA=true } } }</p>
<p>10. IdleADialingB IdleAIdleB { i { {On-hook B} } o { } } p { true } a { {term=true;IdleB=true;DialingB=false} } }</p>	<p>16. CallingACalledB ConnectedCallerAConnectedCalledB { i { {Off-hook B} } o { } } p { true } a { } } }</p>

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FIG. 5

```

    }
17. DialingADialingB DialingABusyB {
    i { {Dial B A} }
    o { {LineBusyTone B} }
    p { true }
    a { { DialingB=false } }
    }
18. CalledACallingB IdleALimboB {
    i { {Timeout AB} }
    o { { } }
    p { true }
    a { { IdleA=true } }
    }
19. ConnectedCallerAConnectedCalledB IdleALimboB {
    i { {On-hook A} }
    o { { } }
    p { true }
    a { { IdleA=true } }
    }
20. ConnectedCallerAConnectedCalledB HoldCallerAHoldCalledB {
    i { {On-hook B} }
    o { { } }
    p { true }
    a { { } }
    }
21. IdleAIdleB DialingAIdleB {
    i { {Off-hook A} }
    o { {DialTone A} }
    p { !term }
    a { {IdleA=false; DialingA=true} }
    }
22. DialingABusyB BusyABusyB {
    i { {Dial A B} }
    o { {LineBusyTone A} }
    p { true }
    a { { DialingA=false } }
    }
23. IdleALimboB IdleAIdleB {
    i { {On-hook B} }
    o { { } }
    p { true }
    a { {term=true;IdleB=true} }
    }
24. LimboAIdleB IdleAIdleB {
    i { {On-hook A} }
    o { { } }
    p { true }
    a { {term=true;IdleA=true} }
    }
25. HoldCalledAHoldCallerB ConnectedCalledAConnectedCallerB {
    i { {Off-hook A} }
    o { { } }
    p { true }
    a { { } }

```

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FIG. 6

<p>26. DialingABusyB IdleABusyB { i { {On-hook A} } o { } } p { true } a { { DialingA=false; IdleA=true } } }</p> <p>27. DialingABusyB DialingIdleB { i { {On-hook B} } o { } } p { true } a { { IdleB=true } } }</p> <p>28. HoldCallerAHoldCalledB DialingIdleB { i { {Timeout AB} } o { {DialTone A} } p { true } a { { DialingA=true; IdleB=true } } }</p> <p>29. DialingIdleB CallingACalledB { i { {Dial A B} } o { {AudibleRinging A,Ringing B} } p { true } a { {DialingA=false; IdleB=false} } }</p> <p>30. IdleADialingB CalledACallingB { i { {Dial B A} } o { {AudibleRinging B,Ringing A} } p { true } a { { IdleA=false; DialingB=false } } }</p> <p>31. BusyABusyB IdleABusyB { i { {On-hook A} } o { } } p { true } a { { IdleA=true } } }</p>	<p>32. CalledACallingB IdleIdleB { i { {On-hook B} } o { } } p { true } a { {term=true;IdleA=true;IdleB=true} } }</p> <p>33. ConnectedCalledAConnectedCallerB HoldCalledAHoldCallerB { i { {On-hook A} } o { } } p { true } a { } } }</p> <p>34. BusyIdleB BusyADialingB { i { {Off-hook B} } o { {DialTone B} } p { true } a { { IdleB=false; DialingB=true } } }</p> <p>35. LimboIdleB DialingIdleB { i { {Timeout A} } o { {DialToneA} } p { true } a { { DialingA = true; } } }</p> <p>36. IdleALimboB DialingALimboB { i { {Off-hook A} } o { {DialTone A} } p { true } a { {IdleA=false;DialingA=true} } }</p> <p>37. LimboIdleB LimboADialingB { i { {Off-hook B} } o { {DialTone B} } p { true } a { {IdleB=false;DialingB=true} } }</p>
---	--

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FIG. 7

<pre> } 38. DialingALimboB IdleALimboB { i { {On-hook A} } o { } } p { true } a { {IdleA=true;DialingA=false} } } 39. BusyALimboB IdleALimboB { i { {On-hook A} } o { } } p { true } a { IdleA=true } } 40. LimboABusyB IdleABusyB { i { {On-hook A} } o { } } p { true } a { IdleA=true } } 41. LimboADialingB IdleADialingB { i { {On-hook A} } o { } } p { true } a { IdleA=true } } 42. DialingALimboB DialingAIdleB { i { {On-hook B} } o { } } p { true } a { IdleB=true } } 43. DialingAIdleB IdleAIdleB { i { {On-hook A} } o { } } p { true } a { {term=true;IdleA=true;DialingA=false} } </pre>	<pre> } 44. BusyALimboB BusyAIdleB { i { {On-hook B} } o { } } p { true } a { IdleB=true } } 45. BusyAIdleB IdleAIdleB { i { {On-hook A} } o { } } p { true } a { {term=true;IdleA=true} } } 46. LimboADialingB LimboAIdleB { i { {On-hook B} } o { } } p { true } a { {DialingB=false;IdleB=true} } } 47. LimboABusyB LimboAIdleB { i { {On-hook B} } o { } } p { true } a { IdleB=true } } 48. CalledACallingB ConnectedCalledAConnectedCallerB { i { {Off-hook A} } o { } } p { true } a { } } } 49. DialingALimboB BusyALimboB { i { {Dial A B} } o { {LineBusyTone A} } p { true } a { DialingA=false } </pre>
---	---

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FIG. 8

```

    }
50. DialingADialingB IdleADialingB {
    i { {On-hook A} }
    o { } }
    p { true }
    a { {IdleA=true; DialingA=false} }
    }
51. LimboADialingB LimboABusyB {
    i { {Dial B A} }
    o { {LineBusyTone B} }
    p { true }
    a { DialingB=false }
    }
52. CallingACalledB LimboAIdleB {
    i { {Timeout AB} }
    o { } }
    p { true }
    a { { IdleB=true; } }
    }
53. BusyAIdleB DialingAIdleB {
    i { {Timeout A} }
    o { {DialTone A} }
    p { true }
    a { DialingA=true }
    }
54. DialingADialingB DialingAIdleB {
    i { {On-hook B} }
    o { } }
    p { true }
    a { { DialingB=false; IdleB=true } }
    }
55. BusyADialingB DialingADialingB {
    i { {Timeout A} }
    o { {DialTone A} }
    p { true }
    a { DialingA=true }
    }
    }
56. ConnectedCalledAConnectedCallerB LimboAIdleB {
    i { {On-hook B} }
    o { } }
    p { true }
    a { { IdleB=true } }
    }
57. BusyALimboB DialingALimboB {
    i { {Timeout A} }
    o { {DialTone A} }
    p { true }
    a { DialingA=true }
    }
58. HoldCallerAHoldCalledB ConnectedCallerAConnectedCalledB {
    i { {Off-hook B} }
    o { } }
    p { true }
    a { } }
    }
59. BusyABusyB DialingABusyB {
    i { {Timeout A} }
    o { {DialTone A} }
    p { true }
    a { DialingA=true }
    }
60. CallingACalledB IdleAIdleB {
    i { {Onhook A} }
    o { } }
    p { true }
    a { {term=true;IdleA=true;IdleB=true} }
    }
61. LimboADialingB DialingADialingB {
    i { {Timeout A} }
    o { {DialTone A} }
    p { true }
    a { DialingA=true }
    }

```

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FIG. 9

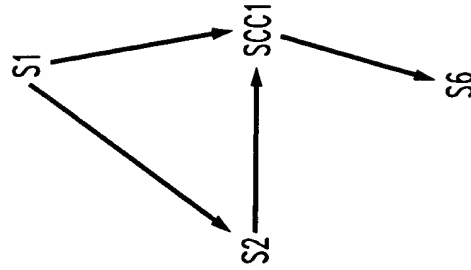
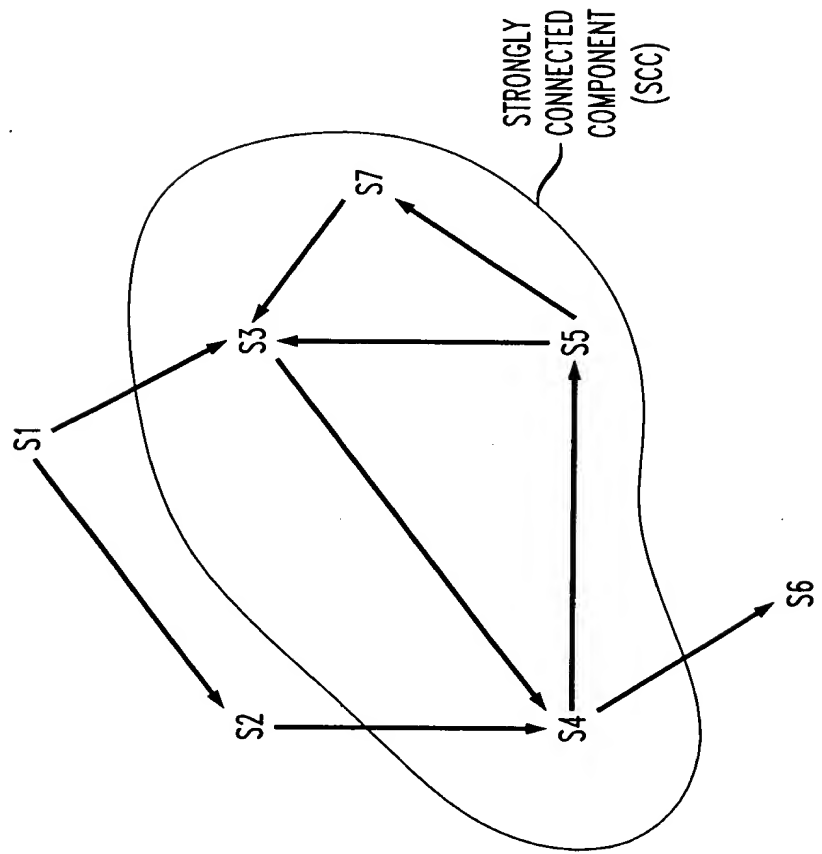
<pre> } 62. LimboABusyB DialingABusyB { i { {Timeout A} } o { {DialTone A} } p { true } a { DialingA=true } } 63. IdleABusyB IdleADialingB { i { {Timeout B} } o { {DialTone B} } p { true } a { DialingB=true } } 64. DialingABusyB DialingADialingB { i { {Timeout B} } o { {DialTone B} } p { true } a { DialingB=true } } 65. DialingALimboB DialingADialingB { i { {Timeout B} } o { {DialTone B} } p { true } a { DialingB=true } } 66. BusyABusyB BusyADialingB { i { {Timeout B} } o { {DialTone B} } p { true } a { DialingB=true } } 67. BusyALimboB BusyADialingB { i { {Timeout B} } o { {DialTone B} } p { true } a { DialingB=true } </pre>	<pre> } 68. LimboABusyB LimboADialingB { i { {Timeout B} } o { {DialTone B} } p { true } a { DialingB=true } } </pre>
---	---

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FIG. 10

1 GENERATE ALL ACYCLIC PATHS

1a. COLLAPSE STRONGLY CONNECTED COMPONENTS INTO A SINGLE NODE

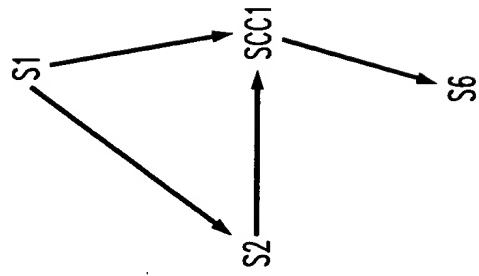


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FIG. 11

1 GENERATE ALL ACYCLIC PATHS

1b DETERMINE ALL PATHS IN DAG:



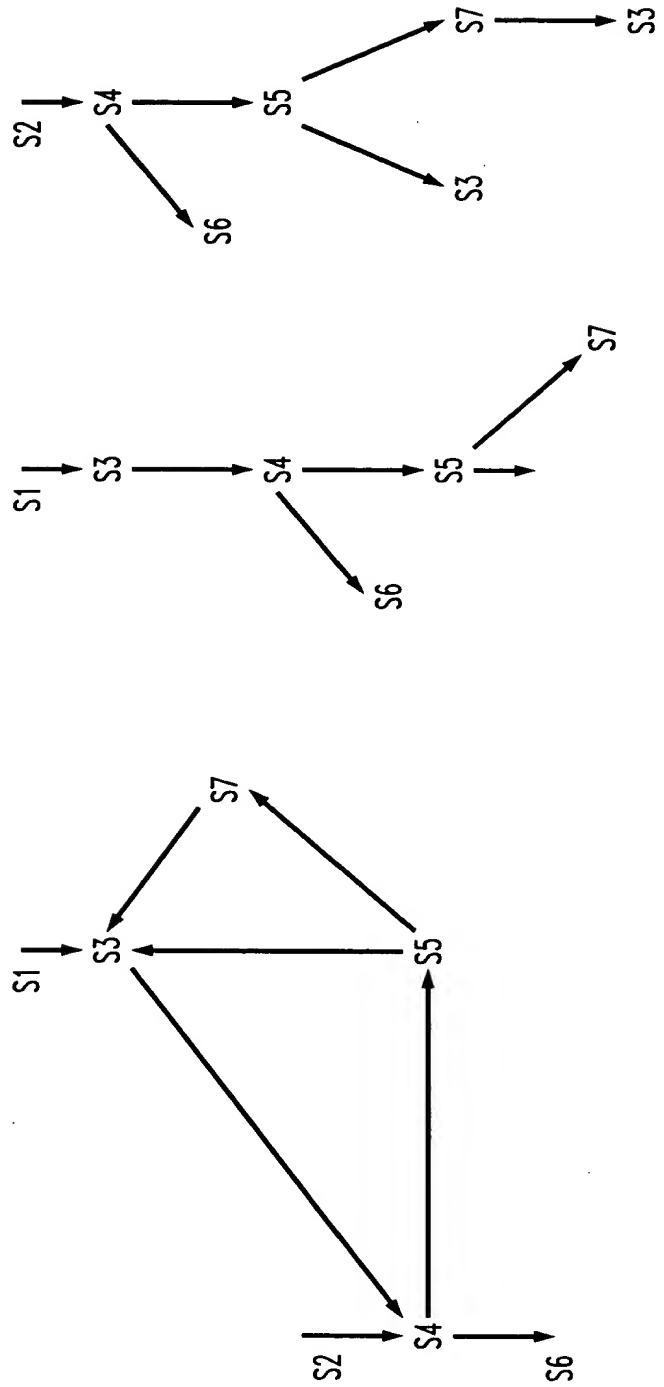
S1, S2, SCC1, S6
S1, SCC1, S6

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FIG. 12

1 GENERATE ALL ACYCLIC PATHS

1c BUILD NEXT-TRANSITION TREE FOR SCC:

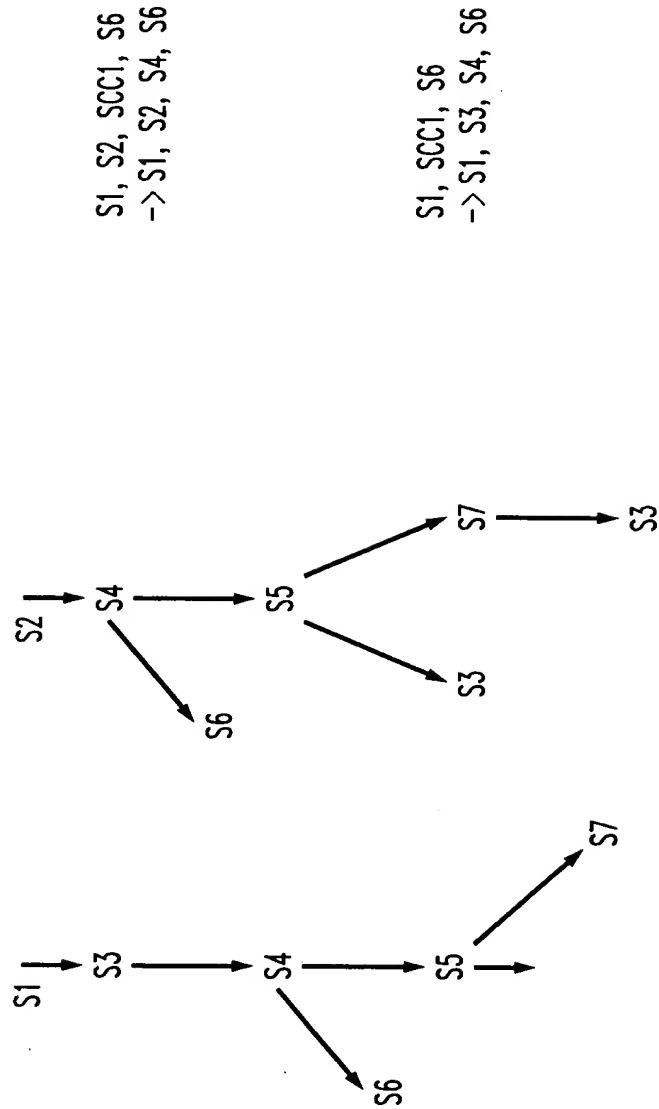


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FIG. 13

1 GENERATE ALL ACYCLIC PATHS

1d EXPAND EACH SCC WITH ALL PATHS THROUGH NEXT-TRANSITION TREE

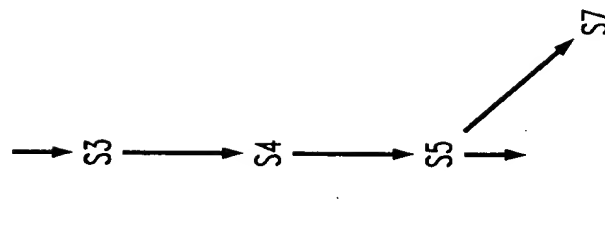


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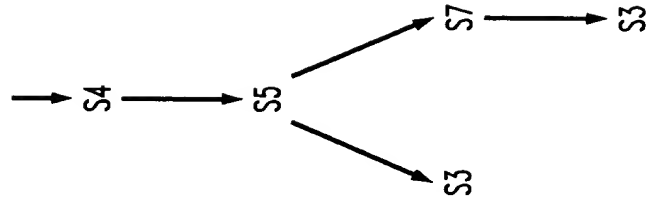
FIG. 14

2 GENERATE ALL SIMPLE CYCLES

RE-USE NEXT-TRANSITION TREE



S3, S4, S5, S3
S3, S4, S5, S7, S3



S4, S5, S3, S4
S4, S5, S7, S3, S4

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FIG. 15

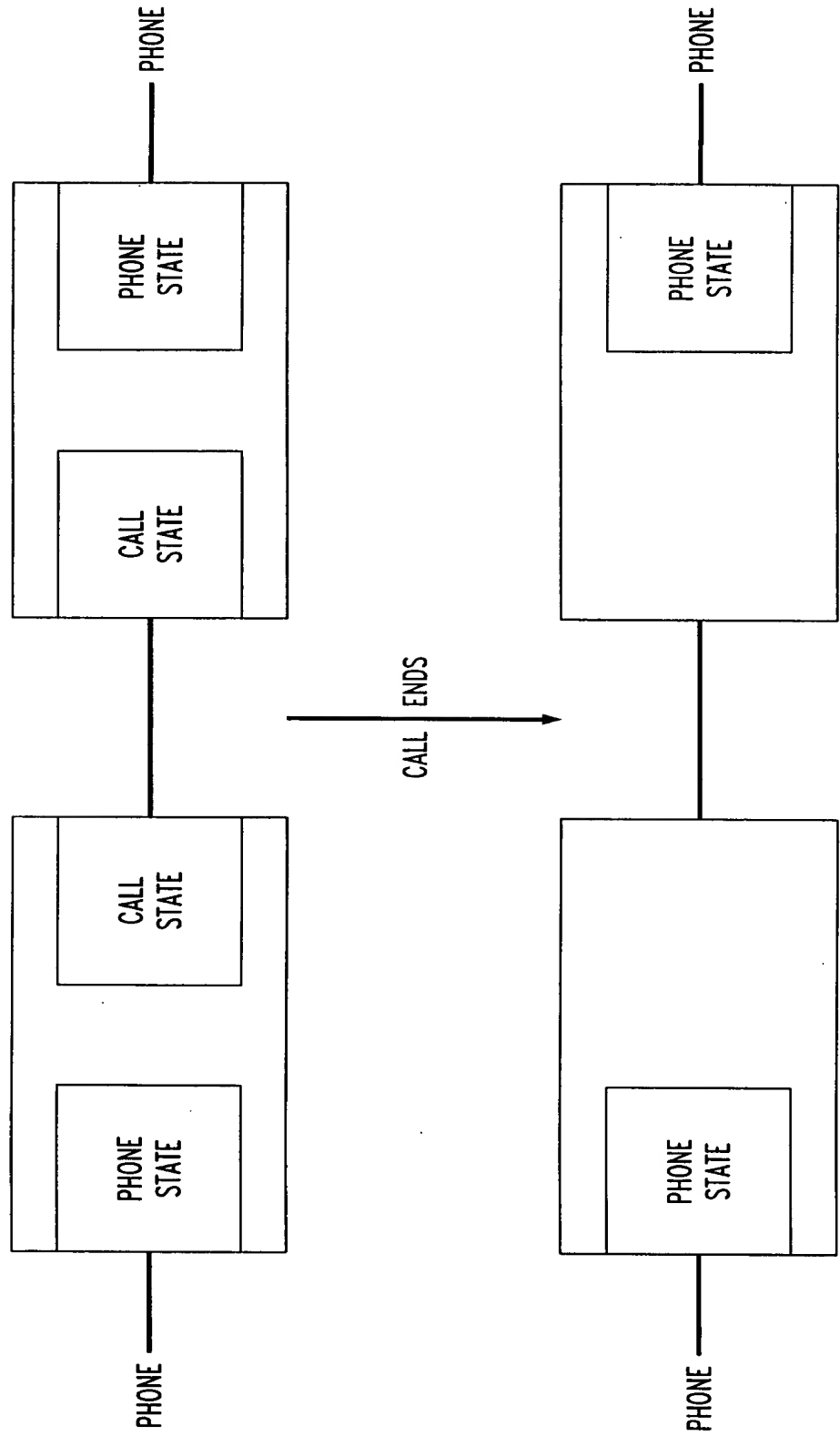
3 COMBINE THE PATHS AND THE CYCLES

$$\begin{array}{l}
 \begin{array}{l}
 S1, S2, S4, S6 \\
 S1, S3, S4, S6
 \end{array}
 +
 \begin{array}{l}
 S3, S4, S5, S3 \\
 S3, S4, S5, S7, S3
 \end{array} \\
 \\
 =
 \begin{array}{l}
 S1, S2, S4, S5, S3, S4, S6 \\
 S1, S2, S4, S5, S7, S3, S4, S6 \\
 S1, S3, S4, S5, S3, S4, S6 \\
 S1, S3, S4, S5, S7, S3, S4, S6
 \end{array}
 \end{array}$$

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FIG. 16

CRITERIA FOR ADEQUATE COVERAGE



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FIG. 17

